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BRITISH STEEL CORPORATION RESEARCH REPORT

STRIP MILLS DIVISION

BIBLIOGRAPHY OF PUBLISHED LITERATURE ON ASPECTS OF PHYSICAL QUALITY OF HOT ROLLED STEEL STRIP (1960 to 1970)

D. Brinn

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SECTION 1

SURFACE DEFECTS AND QUALITY

1. SOME UNUSUAL DEFECTS ON FLAT PRODUCTS
LeBas, J.
B.H.P. Tech. Bull, 1960, 4 (3), 26-32 and 1961, 5, (1) 27-29

This article briefly discusses defects on strip before and after cold reduction. Among various defects discussed are deep scratches produced during hot-coiling with friction sparking as a probable source, rolled in mill-scale and rolled in scarfing swarf. (Illustrated with photographs and micros).

2. SURFACE DEFECTS IN ROLLING
Ryzhkov, P. Ya. and Shereshevskaya, R.M.
Metallurgist, 1961, (5) 229-231

Short paper describing deliberate introduction of defects to allow metallographic standards to be prepared for subsequent non-artificial defects. Defects were made by introduction of:- ferrophosphorus, graphite, cast iron, tar (grease), scale and fireclay.

3. IMPROVING THE SURFACE QUALITY OF METAL ROLLED FROM LARGE INGOTS
Antonov, S.P. et al.
Stal in English, 1962, August, 624-627

Reports on ingot design and heat treatment to improve surface quality of steel from 21 ton rimming steel ingots and 24.5 ton killed steel ingots.

4. CAUSES OF THE FORMATION OF "ROLLED-IN" SCALE
Kuzmin, V.I.
Translation HB 6002 (Ex-Izvest VUZ Chern. Met. 1963, (6) 96-99)

Investigation of causes of rolled-in scale in low-alloy steel strip and plate based on rolling experiments and gravimetric, spectro and metallographic analysis. Statement of true origin of rolled-in scale and reheating practices to minimize it.

5. EFFECT OF FINAL HOT ROLLING CONDITIONS ON THE STRUCTURE AND PROPERTIES OF LOW CARBON STRIP STEELS INTENDED FOR COLD ROLLING
Dedek, V.
Translation Tollemache 441 (Ex-Hutn. Listy, 1964, 19 (9) 633-641)

In part discusses the character of mill scale and effects of rolling conditions on the scale and its response to pickling.

6. OBSERVATIONS ON THE SCALE STRUCTURES OF MILD STEEL STRIP
Garber, S.
AIME Met. Soc. Conf. Flat Rolled Products 2 Chicago, 1960, 6, 41-59

Previous studies are reviewed; the structure of scale on hot rolled strip is examined in some detail; the origin of scale structures is discussed and properties relevant to the successful removal of scale described. A short discussion follows.

7. THE PRODUCTION OF STRIP FROM CHROMIUM-NICKEL STEEL AT THE ZAPOROZHSTAL WORKS
(IN RUSSIAN)

Berzii, V.V. and Babakov, A.A.
Metalov. Term. Obra. Met. 1965, (3) 50-52

An investigation into the formation of cracks during the unwinding of hot rolled coils in front of a continuous hardening furnace.

8. FACTORS AFFECTING THE SURFACE QUALITY OF STAINLESS STEEL SHEET
Dubrovin, A.K. et al.
Stal in English, 1965, May, 381-383

Improvements in reheating, roll surfaces, mill guides and pickling practice all contribute to an improvement in the surface quality of stainless sheet.

9. FORMATION OF TERTIARY SCALE IN THE HOT ROLLING OF WIDE STRIP (IN GERMAN)
Luyckx, L. and Lorang, F.
CNRM, 1965, Jan. 6-8, BISI 4107

A new hypothesis for the method of formation of rolled-in scale is advanced and tested. Production of strip without the defect is described.

10. SEAMY DEFECTS IN HOT STRIP FROM CAPPED STEEL
Morinag, K. et al.
HB 6914 (ex Tetsu-To-Hagane, 1965, 51, (10) 1895-98)
BISI 7012 (ex Fuji Tech. Repr., 1966, (1) 39-48)

A study of the formation of blowholes and non-metallic inclusions in capped steel for tinplate applications. The defect in the hot rolled band is known variously as "seamy defect", "seamy-scale", "surface scale", or "dispersed sand defect".

11. EFFECT OF THE DEOXIDATION CONDITIONS ON THE FORMATION OF FINE CRACKS IN LOW-CARBON ELECTROTECHNICAL KILLED ARMCO STEEL
Reznik, I.G.
Translation HB 6519 (ex Izvest VUZ Chern Met., 1966, (1), 61-66)

Hairline cracks formed by composite silicates were reduced by varying the normal de-oxidising agents.

12. DISCONTINUITIES IN HOT-ROLLED STEEL CAUSED BY NON-METALLIC INCLUSIONS
Rudnik, S.
JISI, 1966, 204, April, 374-376.

A study of the behaviour of non-metallic inclusions during hot rolling. Fishtailing hot tears and cracks are discussed.

13. CONTROL OF DEFECTS - FLAT ROLLED PRODUCTS
McLean, G.J.
Paper Pittsburgh Reg. Tech. Mtg. AISI, 1965, 227-254

A wide ranging paper dealing with:- cleanliness to minimize fine line slivers caused by sub surface inclusions; scab scarfing; slab finishing temperatures; longitudinal ridges in slabs because of oxygen-stream turbulence at division walls of scarfing head; scale formation; work roll banding, and recoiling.

14. SCALE MARKS ON HOT (ROLLED STEEL) STRIPS
Onada, K. et al.
Translation MT 1049 (ex Sumitome Metals, 1968, 20, (1) 1-8)

Discusses causes, methods of removal and prevention of - scale marks, comets tail scale, seams, coil breaks and insufficient descaling.

15. ON THE QUESTION OF THE FORMATION OF SURFACE DEFECTS DURING HOT ROLLING OF FERRITIC-AUSTENITIC STEEL
(IN RUSSIAN)

Shin, R.G. and Rivkin, A.A.
Izvest VUZ Chern. Met., 1968, (1) 91-94

A study of microcrack formation and tears in hot rolling.

16. MILL SCALE IN HOT ROLLED FLAT PRODUCTS
(IN PORTUGESE)
de Oliveira Ferraz, M.J.
Metalurgia ABM, 1968, 24, (123), Feb. 165-169

Causes of scale formation on hot rolled steel are discussed and methods for removing it are reviewed.

17. IMPROVED SURFACE QUALITY BY SYNCHRONIZATION OF ROLL SPEEDS
Young, R.W. and Sylvester, R.A.
Paper Chicago Reg. Tech. Mtg., AISI, 1968, pp.12

Following an extensive study into "embedded-oxide" surface defect at Jones and Laughlins hot strip mill, a roll synchronization alarm system was developed which enables proper maintenance on the rougher mill thus minimizing the defect and generally improving hot band quality.

18. THE INFLUENCE OF ROLLING PRACTICE IN HOT STRIP MILLS ON THE SURFACE ROUGHNESS OF THE HOT ROLLED STRIP
Funke, P. et al.
Translation BISI 7678 (Stahl Eisen, 1969), 89, (15) 801-7)

Factors discussed include - temp. of initial pass, thickness reduction in finishing train, roll type, and rolling and coiling temperatures.

19. SCALING AND PICKLING PROPERTIES OF HOT-ROLLED STRIP DEPENDING ON THE COOLING CONDITIONS IN VARIOUS HOT ROLLING MILLS
Funke, P. and Wend, E.F.
Translation BISI 7180 (ex Stahl Eisen, 1969, 89, (3) 101-14)

Studies on scale formation and properties based on observations at a number of rolling mills and by laboratory trials.

20. SURFACE DEFECTS IN ROLLED STAINLESS STEEL PLATE
(IN ITALIAN)
Tomei, R.
Met. Ital., 1970, 62, (4), 141-156

Common defects in hot and cold-rolled austenitic and ferritic stainless steels are described and causes given.

21. SURFACE DEFECTS IN PRIMARY ROLLED PRODUCTS
Morgan, E.L.
Steel Times, 1969, 197, (10), 669-673

Blowholes, ingot cracking and mould splash are considered and their influence on subsequent rolling is considered. QC aspects are dealt with.

SECTION 2

GAUGE VARIATION

22. THE CAUSES OF GAUGE VARIATIONS IN HOT STRIP MILLS AND THEIR CORRECTION
Sims, R.B.
Iron Steel Eng., 1960, 37, May, 69-83

In this paper the author points out that the three major types of gauge variation are of the pattern:-
a) a rapid decrease at the front of the coil followed by
b) a slow increase in thickness along the length of the strip climaxed by
c) a rapid gauge increase over the last 100ft of material.
The main cause of these conditions is the differential between finishing speed of last rougher and entry speed of first finisher. The use of loopers and AGC to minimize these conditions are discussed.

23. AUTOMATIC THICKNESS CONTROL - GENEVA WORKS HOT STRIP MILL
Ringerr, L.E. and Koss, G.S.
Iron Steel Eng., 1960, 37, February, 110-120

Although mainly concerned with the AGC system at USS Geneva, the authors do discuss the variability of gauge within the context of its need for control.

24. GAUGE VARIATIONS IN STRIP CAUSED BY ROLLING LARGER SLABS (IN JAPANESE)
Aiko, G. and Hiramoto, T.
Tetsu-To-Hagane, 1962, 48, Nov. 1667-1673

Temperature difference in rolling larger slabs resulting in variation in deformation resistance gives rise to gauge variations. Methods of avoiding these differences and reduction in incidence of skid marks are discussed.

25. TECHNICAL PROBLEMS IN THE OPERATION OF WAKAYAMA HOT STRIP MILL (IN JAPANESE)
Edamoto, M. et al.
Sumi Met., 1963, 15, July, 140-148

Includes a study on the effect of the screw position change at each stand on the finish gauge change.

26. THE ATTENUATION OF DIMENSIONAL VARIATIONS IN ROLLING
Wallace, J.F. and Bayley, K.
Sheet Metal Ind. 1961, April, 242-246

A short general review discussing attentuation of gauge, shape and profile in rolling. Deals with mill stand design and AGC.

27. THE RELATIONSHIP BETWEEN PROGRAMMED OPERATION AND THE FORMATION OF REJECTS ON THE WIDE STRIP MILL AT DUNA IRONWORKS (IN HUNGARIAN)
Komlosy, A.
Koh. Lapok, 1964, 97, (9), 426-430

The author describes the use of scheduling to minimize the amount of rejects caused

through "off-gauge" material.

28. THICKNESS CONTROL IN THE FINISHING STANDS OF CONTINUOUS HOT STRIP MILLS
(IN FRENCH)
Quonten, R.
Rev. Met. 1967, 64, (12), 1063-1083

Causes of gauge variation, methods for measuring them and minimizing them with control apparatus.

29. ROLLING STRIP TO CLOSE TOLERANCES IN CONTINUOUS MILLS
Filatov, A.D.
Stal in English, 1968, (6), 492-493

Factors leading to thickness variations in hot-rolled strip in continuous mills are outlined. The use of AGC at Magnitogorsk is described.

30. CALCULATION OF STRIP THICKNESS VARIATIONS IN WIDE HOT STRIP MILLS
Howard, D.R.
D.U. Translation (ex Neue Hutte, 1967, 12, (11), 667-670)

The strip thickness variations in the finishing stands of a hot strip mill are treated mathematically. Causes of gauge variations are listed and formulae derived which take into account the various influencing factors. Good agreement with practice was obtained.

31. COMPENSATION OF LONGITUDINAL VARIATIONS IN THE THICKNESS OF STEEL STRIP HOT ROLLED IN CONTINUOUS MILLS
(IN RUSSIAN)
Rozenman, E.A. et al.
Izvest. VUZ Chern. Met., 1968, (5), 87-90

Main reason for gauge variation at the front end of the hot rolled coil is due to tension fluctuation. Tail end variation is mainly due to uneven cooling. Compensation is discussed.

32. THE EFFECT OF STRIP WIDTH ON LONGITUDINAL VARIATION IN GAUGE
(IN RUSSIAN)
Gallai, Ya. et al.
Izvest. VUZ Chern. Met., 1968, (5), 91-93

Relationship between strip width and stand rigidity (hence nature of longitudinal variation in gauge) is discussed.

33. CONTROLLING THE DIMENSIONS
Bickwede, D.J.
Metal Prog., 1969, 96, (3), Sept. 99-100

Short item which considers control of sheet thickness in hot strip mills. Controls on cold mills also considered.

34. STRIP THICKNESS CONTROL ON MODERN CONTINUOUS HOT-STRIP MILLS
(IN GERMAN)
Stich, W.
Bander Bleche Rohre, 1970, 11, (1), 48-9

A review of the literature confirms the adequacy of the roll counter cone arrangement for compensating for differences in hot-strip thickness, and of single-heat hot-strip rolling from the ingot, slab or large bloom stage onward.

SECTION 3

STRIP SHAPE

35. COMBATING DISTORTION IN COLD ROLLED ALLOY STEEL SHEET
Markov, R.I.
Stal in English, 1962, June, 457-459

Although mainly concerned with cold rolling, this paper does consider the influence of distortion of the hot rolled strip on subsequent operations.

36. CONTROL OF THE SHAPE OF METAL STRIP ON AN EXPERIMENTAL VARIABLE CAMBER ROLLING MILL
Singer, A.R.E. and O'Brien, J.J.
J.I.S.I. 1962, 200, 1003-1010

Results of trials on shape control conducted on an experimental 5in rolling mill. (4 high cold strip).

37. SHAPE MEASUREMENT AND CONTROL
Pearson, W.K.J.
Jnl. Inst. Metals, 1964/5, 93, (6), 169-178

The causes and dimensions of shape are discussed with a view to defining the requirements for an instrument to measure it continuously. The paper is based on experience in aluminium rolling.

38. THEORY AND PRACTICAL ASPECTS IN CROWN CONTROL
Stone, M.D. et al.
Iron Steel Eng., 1965, 42, Aug. 73-90

A review of the techniques of back-up roll bending for crown control for instantaneous control of rolling to better tolerance and shape. Both hot and cold rolling are discussed.

39. REASONS FOR LONGITUDINALLY INCONSISTENT THICKNESS IN CONTINOUSLY ROLLED STRIP AND METHODS OF PREVENTION
Boyarshinov, M.I. et al.
Stal in English, 1966, Feb. 124-128

A study (Mainly of the temperature/tension relationship) into longitudinal inconsistencies undertaken at Magnitogorsk. Causes and possibilities for elimination.

40. STRIP MILL SHAPE AND CONTOUR CONTROL
Fox, T.A.
Iron Steel Eng., 1966, 43, July, 109-112

Explanation of hydraulic work roll shaping with reference to a 90in hot strip mill.

41. INFLUENCE OF RIGIDITY OF WORKING STAND ON NON-UNIFORMITY IN LONGITUDINAL THICKNESS OF STRIP
Tselikov, A.I. et al.
Stal in English, 1967, April, 319-324

An analysis of effect of roll stand rigidity on longitudinal thickness variation - as applied to cold rolling but conclusions may be adapted to hot rolling.

42. AN ALGEBRA OF STRIP SHAPE AND ITS APPLICATION TO MILL SCHEDULING
Sabatini, B. and Yeomens, K.A.
JISI, 1968, 206, December, 1207-1213

A procedure for mill scheduling and set up is derived based on a simple polynomial approximation to strip profile. The mill is assumed to be rolling under AGC and the scheduling procedure is developed to yield perfect shape at each pass.

43. REDUCTION OF THE LONGITUDINAL IRREGULARITIES IN THE THICKNESS OF STRIP BY MEANS OF AN ARRANGEMENT APPLYING A THRUST TO THE PADS OF THE BACK-UP ROLLS
Filatov, A.D. et al.
Stal in English, 1968, July, 577-580

Description of a technique developed at Magnetogorsk for controlling longitudinal gauge variations.

44. SOME TECHNOLOGICAL FACTORS OF THE PROCESS OF SHEET ROLLING AND THE SHAPE OF THE STRIP
(IN RUSSIAN)
Zheleznov, Yu. D. et al.
Izvest VUZ Chern. Met., 1968, (11), 72-76

A method for a theoretical qualitative and quantitative evaluation of the influence of controlling actions and various disturbances on the shape of strip during rolling is developed. It can be used for the analysis of causes of non-uniformity of stretching along the width of the strip and synthesis of an automatic stabilization of the shape.

45. THE EFFECT OF STRIP TENSION ON THE QUALITY OF STRIP AND CONTROL OF THE ROLLING OPERATION
(IN GERMAN)
Shelesnow, J.D. et al.
Neue Hutte, 1968, 13, (9), 531-534

The causes of shape errors are described and correction by adjustment of tension is discussed. A magneto-elastic measuring probe was developed which measured strip tension along the width at different points. The output is sensitive and is independent of slight changes in:- air gap strip to probe; strip thickness or rolling speed.

46. REDUCTION IN THICKNESS VARIATIONS IN STRIP ROLLED ON A 20 ROLLING MILL
Kovalev, P.M.
Stal in English, 1968, (7), 621-623

Longitudinal and transverse thickness variations in razor blade strip rolled on a 20 mill were examined and methods for reducing them proposed. A high proportion of the variations were longitudinal and these were decreased by measures including - reducing roll deflection in the hot rolling mill, increasing the thickness of the strip to be rolled on the 20 mill, modifying pass schedule and reducing back tension.

47. USE OF QUICK ACTING METHODS FOR ENSURING FLATNESS OF SHEET ON THE CONTINUOUS HOT ROLLING MILL
Filatov, A.D. et al.
Stal in English, 1970, (4), 286-289

Results of work done at Magnitogorsk for hydromechanical regulation and tension levelling in the production flow.

SECTION 4

STRIP PROFILE

48. CONTOUR CONTROL BY ROLL SHAPING
Tischbein, J.A.
Paper, AISI Reg. Tech, Mtgs., 1963, pp. 93-103

A discussion on the hydraulic roll shaping system at Jones and Laughlin and the effect it had on the contour of strip produced on the mill.

49. EFFECT OF THE INITIAL PROFILE OF THE WORK ROLLS IN THE FINISHING STANDS OF THE CONTINUOUS MILL ON THE STRIP PROFILE
Faizullin, V. Kh. et al.
Stal in English, 1963, July, 541-543

The use of upper work rolls with a concavity ranging between 0.6 and 0.3mm in the finishing stand of the 1450 continuous mill has enabled stock for blackplate of required convex cross-section and necessary transverse thickness variation (0.02-0.05mm).

50. OPTIMUM CROSS-SECTIONAL PROFILE FOR BLACK TINPLATE
Faizullin, V. Kh. and Radyukevich, V.I.
Stal in English, 1962, October, 806-808

Relationship between cross-sectional profile of the cold rolled sheet and the geometry of the hot rolled strip was investigated and the optimum profile of the hot rolled strip was found.

51. EFFECT OF TECHNOLOGICAL FACTORS ON ROLL PROFILING OF THIN SHEET MILLS
Polukhin, P.I. et al.
Stal in English, 1963, Feb. 127-132

Study of thermal profiling of rolls in hot and cold strip mills.

52. INFLUENCE OF HOT STRIP PROFILE ON SUBSEQUENT OPERATIONS
Raybuck, W.
AIME Met. Soc. Conf. Mechanical Working of Steel 2 Chicago, 1964, 26, 425-438

A detailed study of hot strip profile and its effect on cold finishing departments.

53. STUDY OF THE ORIGIN OF RIDGES OCCURRING DURING COLD ROLLING
Rocquet, P. et al.
AIME Met. Soc. Conf. Mechanical Working of Steel 2 Chicago 1964, 26, 401-418

Ridges at the cold mill were found to be due to heterogeneous elongation caused by the presence of alternate coarse/fine grained areas, or of a difference in depth of a coarse grained area on the same strip. These heterogeneities seem to result from differences in the cooling of the hot rolled strip either at the finishing scalebreaker or at the first finishing stand. Roll wear, rolling and coiling conditions at the hot mill affect the intensity of the defect.

54. HOT ROLLED STRIP ABNORMALITIES LEADING TO RIDGE IN COLD REDUCED SHEETS AND TINPLATE
Gilbertson, W.F.
JISI, 1965, 203, June, 553-561

Irregular hot rolled strip cross-section profiles are caused by one or more of the conditions - over-rolling, a set of rolls at a fixed width, burnish, poor contours on work and back-up rolls, careless setting of edges, sub-standard rolls, uneven slab heating or uneven slab dimensions etc.

A detailed description is given of experience with hot strip profile and subsequent effect obtained by rolling at Llanwern and Ebbw Vale. Modifications and methods for optimizing hot strip profile are given. This paper is well illustrated with photographs, micrographs and graphs/drawings of strip profile.

55. INCREASING THE STRENGTH OF BACKING ROLLS ON FOUR-HIGH STANDS AND IMPROVING THE PROFILE OF THE SHEET
Tkalich, K.N. et al.
Stal in English, 1966, April, 292-296

The authors have studied wear, thermal expansion of rolls, roll clearance, pressure per unit length, and have calculated the elastic deformation of the rolls from actual rolling pressures in relation to the sheet in the course of manufacture. The authors suggest optimum roll profile for suitable strip profile.

56. APPLICATION OF MICROWAVE TECHNIQUES IN THE IRON AND STEEL INDUSTRY
Williams, R.V.
ISA Procs. 1967, Nat. Conf. Inst. Iron Steel Ind., 17, 3-1 - 3-3

The author gives a brief description of a microwave technique for monitoring-hot band profile.

57. EFFECT OF WEAR ON THE STRENGTH OF THE ROLLS AND THE DIMENSIONS OF THE SHEET MATERIAL PRODUCED IN HOT ROLLING MILLS FOUR HIGH (IN RUSSIAN)
Tyagunov, V.A. et al.
Izvest VUZ Chern. Met., 1967, (12), 162-165

A statistical treatment of roll wear dealing in part with the wear/time relationship as a guide to fluctuation in dimension of the rolled material.

58. THE DIMENSIONAL ACCURACY OF HOT-ROLLED STRIP (IN CZECH)
Indra, K. et al.
Hutnik, 1968, 18, (3), 129-134

Possible ways by which dimensional defects in hot rolled strip may be removed are discussed. The defects are caused by incorrect roll setting and bad rolling practice. The final profile of the strip is also dependent on wear in the work rolls. The author also discusses the effect of coiler practice on coil quality.

59. CRESCENT SHAPED DISTORTION OF STEEL-STRIP AND ITS RELATION TO THE DISTRIBUTION OF TENSION WITH RESPECT TO STRIP WIDTH (IN RUSSIAN)
Zheleznov, Yu. D. and Nazarov, Yu. E.
Izvest VUZ Chern. Met., 1968, (5), 94-98

The distribution of specific pressure over the width of distorted steel strip is discussed for various values of the initial tension applied between the stand and coiler in relation to the nature of the distortion of the crescent type.

60. ANALYTICAL INVESTIGATION OF THE POSSIBILITY OF STRAIGHTENING OF CRESCENT SHAPES DURING STRIP ROLLING (IN RUSSIAN)
Zheleznov, Yu. D. et al.
Izvest VUZ Chern. Met., 1969, 12, (1), 69-73

An analytical expression relating the absolute difference of reductions along the width and

the crescent shape of the strip is developed. The expression is used for the determination of the necessary range of reduction for straightening the strip.

61. EFFECTS OF TEMPERATURE DROP THROUGH THE THICKNESS OF THE STRIP ON THE UNIFORMITY OF DEFORMATION
Muzalevski, O.G. et al.
Stal in English, 1968, December, 1042-1044

Research conducted on a laboratory mill has shown that to make the depth and transverse deformations over the section of the strip more uniformly distributed, it should be rolled with a surface temperature of 1000°C.

SECTION 5

WIDTH VARIATIONS

62. THE UNEQUAL DEFORMATION OF SLABS ROLLED ON THE CONTINUOUS MILL FOR THIN SHEET
Chekmarev, A.P. et al.
Stal in English, 1965, April, 293-296

If ingots are rolled with worn rolls the slabs produced are "arched" i.e. are uneven in thickness across their width. Rolling such slabs on continuous mills causes considerable contraction in width so that the strip produced is narrower than the normal.

63. ROLLING STRIP TO CLOSER TOLERANCES ON CONTINUOUS MILLS
Filatov, A.D.
Stal in English, 1968, (6), 492-493

The use of width and thickness gauging on the hot mills at Magnitogorsk are described. Factors governing variations are discussed and semi-automatic and automatic corrective devices explained.

64. GEOMETRIC FACTORS AFFECTING SPREAD IN HOT FLAT ROLLING OF STEEL
Helmi, A. and Alexander, J.M.
JISI 1968, 206, (11), 1110-1117

A new formula covering a very wide range of geometric variables was developed from data obtained from some 200 hot rolling experiments.

65. DETERMINATION OF CRITICAL WIDTH OF (STEEL) STRIP IN ROLLING (IN RUSSIAN)
Severdenko, V.P. and Baktinov, Yu. B.
Izvest Akad Nauk Beloruss. SSR, 1970, (2), 13-19

The significance of the critical width in rolling is considered from a practical point of view. New equations are advanced to solve problems of elongation and spread in rolling.

SECTION 6

EDGES

66. EFFECT OF PHASE COMPOSITION OF ELECTRICAL STEELS ON OCCURRENCE OF "FISSURED EDGE"
Dubrov, N.F. et al.
Stal in English, 1960, October, 765-768

An examination of causes of fissured edge in hot rolling silicon steels:- phase compositions, effect of admixtures on phase composition, effect of carbon, manganese, nickel, aluminium are all discussed.

67. THE ACTION OF MANGANESE ON (PREVENTING) FORMATION OF TORN EDGES IN THE CONTINUOUS HOT ROLLING OF LOW CARBON RIMMING STEEL FOR THE TIN MILL
(IN RUSSIAN)
Marinov, A.I.
Stal Supplement No.3, 1961, 150-158

Optimum manganese content prevents torn edges in hot rolling at the temperature of red shortness and also improves microstructure and ageing properties. Manganese also negates the tendency for sulphur to cause tears.

68. EFFECT OF PHASE COMPOSITION OF TRANSFORMER STEEL ON THE PROPORTION OF REJECTS FOR "FISSURED EDGE"
Kazadzhan, L.B. and Proskuryakova, A.A.
Stal in English, 1963, May, 401-403

Damage at strip edge was caused by the ratio of ferrite to austenite (20-40% to 80-60%) as these phases deform differently on rolling. Conditions for producing a single phase are discussed.

69. EDGE CRACKING IN ROLLING OF HEAVILY CROWNED STRIP
Kolbe, C.L.
Trans. ASM Quart., 1964, Dec. 1000-1003

An account of edge cracks with heavy crown strip - particularly silicon steel.

70. EFFECT OF HEATING REGIME FOR SLABS ON QUALITY OF SHEET
Zhdanov, A.A. and Shilkin, Yu. V.
Metallurgist (Metallurg), 1966, (3), 165

Short item on reducing incidence of 'torn-edge". Whilst hot rolling stainless steel by improved slab reheating.

71. SHAPE OF THE EDGES IN HOT ROLLING WITH UNRESTRICTED SPREAD
(IN GERMAN)
Dahl, W. et al.
Archiv. Eisen. 1968, 39, July, 501-9

Study on a small laboratory mill to determine bulging at edges in hot rolling with unrestricted spread.

72. ELIMINATION OF BROKEN EDGES ON HOT ROLLED ELECTRICAL STEEL STRIP
Alyavdin, V.A. et al.

Stal in English, 1969, (2), 172-174

Breakages in the edges of coils of electrical steel obtained from continuously cast slabs are attributable to the accumulation of non-metallic inclusion close to slab corners. By modifying steelmaking and casting practices these defects were entirely eliminated at Novolipetsk works.

73. DECREASING THE NUMBERS OF SURFACE ROLLING DEFECTS DURING THE ROLLING OF SLAB
Safyan, M.M. and Cherner, M.I.
Stal in English, 1968, (10), 863-864

Factors influencing defects on the lateral edges of slabs which are a frequent cause of rolling - defects in sheet are analysed mathematically and the possibilities of reducing or eliminating such defects are examined.

74. EFFECTS OF SLAB PROPERTIES ON DEFECTS OCCURRING AT THE EDGES OF HOT ROLLED TRANSFORMER SHEET
(IN CZECH)
Smid, V. et al.
Hutnik, 1970, 20, (5), 191-4

A study was made of 203 slabs from 55 different melts of silicon steel. Deep surface gassing of slab edges, transverse surface cracks, and the presence of coarse grains in the structure are the main reasons for the defect.

SECTION 7

COIL CHARACTERISTICS

75. HOT STRIP COILER MAINTENANCE: A HISTORY OF PROBLEMS AND SOLUTIONS AT SPARROWS POINT
Leubecker, H.J.
Iron Steel Eng., 1964, 41, 93-105

An engineering appraisal of Bethlehem Steels development of more sophisticated coilers to provide more uniformly wound coils at the hot strip mill.

76. DETERMINATION OF THE OPTIMUM TEMPERATURE FOR COILING HOT ROLLED STRIPS
Chekmarev, A.P. et al.
Stal in English, 1965, Nov. 919-920

The coiling temperature at the Zaporozhstal Works was investigated to determine optimum coiling temperature to improve "scale pickle surface".

77. THE DYNAMICS OF COILERS FOR HOT ROLLED STRIP
Gartsman, S.D. et al.
Stal in English, 1966, (7), 554-557

Soviet experience with improving the design of hot strip coilers. The reduction of vibration when coiling was part of the study.

78. LABORATORY DETERMINATION OF FINISH ROLLING AND COILING CONDITIONS DURING THE HOT-ROLLING OF STRIP IN CONTINUOUS MILLS
Endrle, M.
Translation BISI 5539 (ex Hutn Listy), 1966, 21, (9), 616-620

79. FACTORS AFFECTING TELESCOPING OF COILS IN HOT STRIP MILL DOWNCOILERS
Howell, J.D.A. and Stevens, D.T.
Engineer, 1969, 227, 7 March, 367-369, 14 March, 402-403

Mechanism of coiling and nature of telescoping; effect of tension on telescopic profile; factors affecting telescoping; avoidance of telescoping; points to watch in forming good coil.

SECTION 8

GENERAL ASPECTS

80. EFFECT OF SLAB REHEATING IN CONTINUOUS FURNACES ON THE QUALITY OF THE ROLLED SHEET
Kulakov, A.M. and Plotnikov, P.I.
Stal in English, 1961, November, 850-854

This paper is mainly concerned with optimum design of reheating furnaces but it also contains a section on effect of reheating on specific aspects of metal quality. Defects include heavy gauge, laps, internal cracks, width variation, scale and burning.

81. QUALITY CONTROL IN THE PRODUCTION OF STEEL SHEET FOR DEEP DRAWING AND PRESSING
Thomas, W.O.
Sheet Metal Ind., 1961, 38, Sept. 659-674

A complete survey of quality aspects of deep drawing sheet production from steelmaking through to final rolling. The paper is written within the context of experience at SCOW Port Talbot.

82. CONDITIONS OF HOT STRIP
Yamada, K. et al.
Translation BISI 4279 (ex Nippon Kokan Giho, 1963, Oct. 312-320)

A report dealing with considerations of surface conditions (scale and roll marks), variation in strip width, variation in strip gauge and variation of strip shape on hot strip mills giving causes and suggestions for minimization.

83. INCREASING THE YIELD FROM ROLLING MILLS
(IN CZECH)
Duchon, C.
Hutnik, 1964, 14, (3), 131-134

A short general paper reviewing the reasons for rejects at the hot strip mill and methods of minimizing them

84. POSSIBILITIES OF AUTOMATING THE NON-DESTRUCTIVE TESTING OF HOT ROLLED PRODUCTS DURING CONTINUOUS OPERATION
Fink, K.
Translations HB 6404 and HB 6600 (ex Stahl Eisen, 1965, 85, 25 March 353-372

Automatic NDT using X-ray, gamma ray, neutron irradiation, eddy current, magnetics etc. for continuous monitoring of internal faults, surface defects etc. in hot rolled products.

85. QUALITY CONTROL - COMPUTER SYSTEM FOR A HOT STRIP MILL
Meredith, R.M.W.
Steel 1966, 39, 140-148

A description of the computer quality control function at Spencer Works.

86. QUALITY CONTROL OF STEEL STRIP
Hundy, B.B. and Wortley, G
Production Eng. 1965, 44, Nov. 621-636

The quality control system at Steel Peech and Tozers is described.

87. WIDE STRIP HOT ROLLING ASPECTS RELATED TO FINISHED PRODUCT QUALITY
Gardini, E.
Translation BISI 6122 (ex Met. Ital. 1967, 59, June, 437-444)

An account of experience at the Italsider Steelworks on Q.C. of wide hot strip. Defects reviewed include:- scale, scratches, edge-oxide, buckling. Flatness, profile and gauge are also briefly discussed.

88. THE AUTOMATION OF HOT STRIP MILLS
Fiebig, E.
AEG Progress, 1966, (3), 150-155

The relationship between quality and automation is discussed. The use of AGC and loopers to improve thickness, width and shape parameters is described.

89. CONDITIONS FOR ROLLING THIN SHEET AND STRIP WITH AN EVEN SURFACE (IN RUSSIAN)
Abdulov, Yu. P. and Suyarov, D.I.
Trudy. Inst. Met. Sverdlovsk, 1965, (12), 69-80

Results of experiments with copper and lead rolling to theoretically analyze conditions required for obtaining even surfaces in commercial rolling mills.

90. QUALITY ASPECTS OF HOT STRIP ROLLING
Rai, R.
Trans. Indian Inst. Metals, 1969, 22, (1), 1-4

A typical hot strip mill is described and rolling practice discussed. Fundamentals of temperature control to achieve desired grain size and structure are discussed. The required physical properties - width, surface, gauge and shape are also reviewed.

SOME REFERENCES ON WIDTH GAUGES FOR HOT STRIP MILLS

ON THE GE WIDTH GAUGE FOR A HOT STRIP MILL
Jono, E. et al.
Yawata Tech. Report (English) 1962, (270), Sept. 3936-3939

HOT STRIP WIDTH GAUGE - (PHILCO WIDSCAN)
Anon.
Iron Age Met. Int., 1965, 4, Jan, 21

CONTACTLESS WIDTH MEASUREMENT IN HOT STRIP MILLS (AEG)
(IN GERMAN)
Lude, R. et al.
AEG mitt, 1964, 54, (11/12) 696-701

PRECISION GAUGING STRIP WIDTH AND THICKNESS
Harrell, J.B.
Iron Steel Eng. 1964, 41, 129-134

GRANITE CITY STEEL USES ULTRAVIOLET WIDTH GAUGE
Gulton Industries Inc.
Iron Steel Eng., 1965, 42, Sept. 231-232

A NEW DIGITAL WIDTH GAUGE FOR THE STEEL INDUSTRY
Krauss D.M. and Trace, J.J.
Iron Steel Eng. 1967, 44, March, 93-99

DIGITAL STRIP WIDTH MEASUREMENT
Huebner, J.R. and Kurz, R.S.
ISA Inst. in Iron Steel Ind., 1968, 18, 64-69

SOME REFERENCES ON THICKNESS GAUGES FOR HOT STRIP MILLS

MEASUREMENT OF THICKNESS WITH GAMMA RAYS
Burbach, W. and Flormann, P.
AEG Progress, 1966, (4), 184-190

STRIP THICKNESS MEASUREMENT WITH RADIO NUCLIDES
Anon.
Metals, 1966, 1, Nov. 58-60

SOME REFERENCES ON INSPECTION EQUIPMENT IN GENERAL FOR HOT STRIP MILLS

DETECTION OF FLAWS IN STEEL SHEET BY ULTRASONICS
Tajiri, I. et al.
Translation HB 5761 (ex Tetsu-To-Hagane, 1962, 48, (4) 515-7)

CONTINUOUS ULTRASONIC TESTING OF HOT ROLLED STRIP
Brand, L.
Translation HB 6546 (ex Stahl Eisen, 1965, 85, (9), 519-26)

ULTRASONIC INSPECTION OF FLAT ROLLED STEEL
Silber, F.A.
Translation HB 6526 (ex BHM 1965, (3), 66-71)

ULTRASONIC INSPECTION OF HOT AND COLD ROLLED STRIP
Kopineck, H.J.
Translation HB 7283 (ex Stahl Eisen, 1967, 87, (20), 1198-1201)

SOME TECHNIQUES FOR AUTOMATIC AND SEMI-AUTOMATIC SURFACE INSPECTION OF HOT ROLLED STEEL PRODUCTS
Baulk, R.H. and Jakeways, R.J.
Paper Non Destructive Examination in Iron Steel Ind. ISI, Pub. 103, 1967, 1-22

AUTOMATED ULTRASONIC EQUIPMENT IN PRODUCTION CONTROL OF THICK STEEL STRIP (ON HOT ROLLING MILLS)
(IN GERMAN)
Hein, A. and Carius, W.
Materialpruf, 1970, 12, (2), 53-55